Claims

1. A method of converting heat energy from a fluid into mechanical energy by expanding an evaporated working fluid in an expansion device connected to an evaporator (7), **characterized in that** heat energy evaporates a working fluid by means of heat exchange in an evaporator (7) and/or heat energy is transformed by at least one or more series-connected heat pumps to a higher temperature level to evaporate the working fluid in the evaporator (7) by means of heat exchange, wherein the evaporated working fluid is an evaporated mixture of at least two components and expanded in a low-pressure expansion device (8), wherein the energy of the working fluid set free by the expansion is partially converted to mechanical energy and wherein at least one second evaporated component has its temperature raised downstream of the low-pressure expansion, and energy is withdrawn form at least one first component of the working fluid so that the energy contained in the expanded, evaporated, higher-temperature second component(s) of the working fluid is recyclable into the evaporator and usable for evaporating additional working fluid.

2. The method according to claim 1, **characterized in that** at least part of the energy, preferably the whole energy, required for raising the temperature of the second component(s) after low-pressure expansion can be gained from the energy set free in an absorption and/or adsorption process.

3. The method according to claim 1 or 2, **characterized in that** the working fluid is formed as a mixture, and a first component is absorbed in and/or downstream of the low-pressure expansion device by means of an absorption fluid, whereby heat is transferred to the second component remaining evaporated, which is recyclable.

4. The method according to any one of the preceding claims, **characterized in that** the mixture is azeotropic at a certain mixing ratio and has a minimum boiling point.

5. The method according to any one of the preceding claims, **characterized in that** the working fluid is present as an azeotropic mixture or as a mixture with a

lowered boiling point with respect to the boiling point of the component having the highest boiling point, wherein working fluids in the form of mixtures are preferred which have their boiling point reduced by at least 5° C, preferably by at least 10° C, more preferably by at least 15° C, even more preferably by at least 20° C, and most preferably by at least 25° C.

6. The method according to any one of the preceding claims, **characterized in that** the absorption of the first component(s) is controlled in such a way that the second component(s) remaining evaporated is heated to a temperature above the boiling point of the mixture and the second component(s) is condensed in a heat exchanger, whereby the evaporation of the working fluid is carried out.

7. The method according to any one of the preceding claims, **characterized in that** the working fluid is a solvent mixture with a low molar evaporation enthalpy which has organic and/or inorganic solvent components, wherein one of the components can be a protic solvent.

8. The method according to any one of the preceding claims, **characterized in that** the absorption fluid is a reversibly immobilizable solvent which, in its non-immobilized aggregate state, is the first component of the working fluid.

9. The method according to any one of the preceding claims, **characterized in that** the working fluid is a mixture of water and silicone.

10. The method according to any one of the preceding claims, **characterized in that** the working fluid is a silicate solution.

11. The method according to any one of the preceding claims, **characterized in that** the low-pressure expansion device is a roots blower.

12. The method according to claim 11, **characterized in that** the roots blower is configured with at least one injection opening through which an absorption fluid or a protic solvent can be introduced into the roots blower.

13. The method according to any one of the preceding claims, **characterized in that** an absorption device is downstream of the low-pressure expansion device for absorbing the first component(s) of the working fluid, wherein the absorption device is preferably configured as a scrubber.

14. The method according to any one of the preceding claims, **characterized in that** a separating device separates the absorbed first component(s) from the absorption fluid.

15. The method according to claim 14, **characterized in that** the separating device is configured as a membrane system.

16. The method according to claim 14, **characterized in that** the separating device is a generator unit, in which the absorbed first component is desorbed by heating.

17. The method according to any one of the preceding claims, **characterized in that** the absorption fluid is fed to the separating device and subsequently back to the scrubber by means of a pump.

18. The method according to claim 1, **characterized in that** the heat pump is driven by a mechanical evaporator or by a liquid sealed compressor system.

19. The method according to claim 18, **characterized in that** the heat pump is formed as an absorption heat pump with an azeotropic mixture, wherein the temperature increase is carried out by absorbing one component and transferring the absorption energy to the second component remaining evaporated.

20. The method according to claim 1, **characterized in that** the fluid is a one or more-component gas or a one or multi-component fluid.

21. The method according to claim 20, **characterized in that** the fluid is a gas or liquid flow from industrial cooling, heat exchange, transformation or expansion processes.

22. The method according to claim 1 and 20, **characterized in that** the fluid is atmospheric ambient air with water vapor contained in it as air moisture.

23. The method according to any one of the preceding claims, **characterized in that** the heat energy is composed of noticeable and/or latent heat of individual or plural components.

24. A system for converting heat energy into mechanical energy, **characterized in that** it comprises the following components:

    a) an evaporator unit (7) in which a working fluid formed as a mixture can be evaporated,

    b) a low-pressure expansion device (8),

    c) an absorption device (10) and/or an adsorption device (10), integrated with the low-pressure expansion device (8) and/or downstream of the low-pressure expansion device (8),

    d) a separating device (12) formed as a membrane system or a thermal generator system, in which the absorbed component is separated from the absorption fluid, and a pump with which the absorption fluid is fed to the separating device (12) and back to the absorption device (10),

    e) at least one energy source which is in contact with the evaporating unit (7), by means of which heat energy can be generated which is taken up in a fluid flow in the evaporator (1) in order to transform the fluid flow to a higher temperature level.

25. The system according to claim 24, **characterized in that** the energy source(s) is a heat pump, a fuel cell and/or a solar energy system.

26. The system according to claims 24 or 25, **characterized in that** the low-pressure expansion device is a roots blower.

27. The system according to claims 24 to 26, **characterized in that** a separating assembly separates the absorbed first component from the absorption fluid.

28. The system according to any one of the preceding claims, **characterized in that** the low-pressure expansion device is connected to a generator (9) for converting the mechanical energy to electric energy.

29. The system according to any one of claims 24 to 28, which can be operated according to any one of the above methods.

30. The method according to any one of claims 1 to 23, wherein the method comprises an additional method step in which the condensate water produced when heat pump(s) are used is processed in an additional process step to industrial water and/or to drinking water.